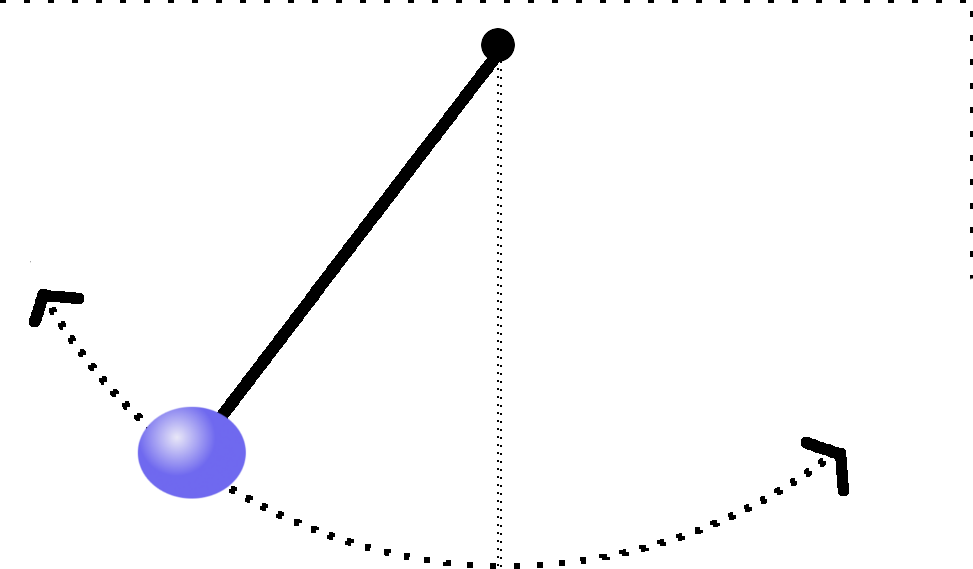
**MM1A3. Students will solve simple equations.** b. Solve equations involving radicals such as, √x + b = c using algebraic techniques.

# ****Pendulum Learning Task****

In this task, you will explore the physics of pendulums.



Your pendulum will be made from string tied to a simple weight on one end and to a fixed point on the other end.

A pendulum’s period (T) is a function of the length of string leading to the weight (L). The equation is below. Note: 384 is the acceleration due to gravity in inches/second2, π is 3.14, and T is the number of seconds it takes your pendulum to complete a full swing.

1. Study the pendulum function and the diagram above it.
   1. What is the period of a pendulum with a 4 inch long string? A 16 inch long string?
   2. What length string is required for a pendulum to have an 8 second period?
   3. The irrational number π is usually associated with circles. Why do you think it appears in the pendulum function?
2. Graph the pendulum function T(L). What domain and range make sense in this project?
3. Verify that the pendulum function T(L) by building a pendulum. Make a table of values for L (length of string) and T (period). Describe how your experimental values compare to those predicted by the function, T(L).
4. Radical functions require algebraic skills that include finding common denominators. Solve these problems to become an algebraic ninja.
5. You want to decrease a pendulum’s period from 5 seconds to 4 seconds. Should you shorten the string or make it longer? Why? (refer to the function, T(L), in your explanation)

## Challenge: Build a Pendulum of Period T

Time to put your skills with pendulums to the test! I want you to build a pendulum with a specific period.

You have the following materials:

|  |
| --- |
| String, 10 feet long  Weights of several masses & sizes  Scissors  Stopwatch |

Period (T) value 1: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Theoretical length (L) of string: *with work shown*

Experimental value:

Explanation for any difference:

Period (T) value 2: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Theoretical length (L) of string: *with work shown*

Experimental value:

Explanation for any difference:

## Rubric

*Turn this rubric in with your final project.*

Student name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_\_\_

Project format:

* Poster
* PowerPoint
* Movie
* Essay
* Free choice: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |
| --- | --- | --- |
| **Project Element** | **Outstanding projects will…** | **Grading** |
| Study the function T(L) | analyze the function and diagram to explain the connection to π, a constant usually associated with circles. (Question #1) | 10% |
| Level of mastery: C:\Users\Meg\Documents\Teaching Files\Math 1 Unit 5\Tasks\likertscale.png | |
| Graph T(L) | graph the pendulum function, T(L) with the correct domain and range represented. (Question #2) | 10% |
| Level of mastery: C:\Users\Meg\Documents\Teaching Files\Math 1 Unit 5\Tasks\likertscale.png | |
| Verify T(L) | verify the theoretical results from T(L) by building a pendulum, measuring its period, and comparing to T(L). Results of the experiment are presented and discussed. Sources of error are explored. (Questions #3 & 5) | 30% |
| Level of mastery: C:\Users\Meg\Documents\Teaching Files\Math 1 Unit 5\Tasks\likertscale.png | |
| Practice solving radical equations | correctly solve practice problems given in the project document. (Question #4) | 10% |
| Level of mastery: C:\Users\Meg\Documents\Teaching Files\Math 1 Unit 5\Tasks\likertscale.png | |
| Build a pendulum of period T | build a pendulum with a period as given by the teacher. (Challenge problem) | 30% |
| Level of mastery: C:\Users\Meg\Documents\Teaching Files\Math 1 Unit 5\Tasks\likertscale.png | |
| Examine differences between theoretical & experimental results | explore reasons why the theoretical value for period of a pendulum and the experimentally measured value may differ. Reasons are plausible & significant. (Challenge problem) | 10% |
| Level of mastery: C:\Users\Meg\Documents\Teaching Files\Math 1 Unit 5\Tasks\likertscale.png | |